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Opportunities for Regional Harmonization of Appliance Standards & Labeling Program

Nexant

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OPPORTUNITIES FOR REGIONAL HARMONIZATION OF APPLIANCE LABELING AND STANDARDS PROGRAM

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Executive Summary

Benefits of Energy Efficiency Standards and Labeling Program

During the past decade, the nations of South Asia have experienced difficulty in maintaining an adequate and reliable supply of electricity. For example, India's power system typically has a peak demand deficit of around **14.5%**[1]. One tool at policymakers' disposal which addresses the growth in electricity demand is a program of Energy Efficiency Standards and Labeling for appliances (EES&L). The aim of such a program is to increase consumer demand for high-efficiency electrical appliances, and to remove the most inefficient products from the market. Such programs have demonstrated themselves as highly cost effective means of reducing electricity demand, thus avoiding the large capital investments associated with increasing generation capacity. More specifically, over the past decade, a significant number of Asian countries have implemented successful EES&L programs and continue to expand and improve them.

Within South Asia in particular, some EES&L programs are already implemented, others are currently being launched, and still others are in the planning stage. Specifically, Sri Lanka has had a labeling program for fluorescent lamp ballasts for several years. After a long program promoting compact fluorescent lamps, the government of Sri Lanka is now implementing a labeling program for these products. Indian programs for labeling refrigerators and air conditioners are nearing implementation. The Governments of Nepal and Bangladesh are still in the planning stages of a program, but both have taken the important steps of establishing committees with responsibility for identifying appliances to target, establishing test facilities, and setting efficiency rating levels. Nepal has so far identified fluorescent lamp ballasts as the first product to be labeled for efficiency.

The South Asia Regional Initiative for Energy (SARI/Energy), promotes mutually beneficial energy linkages among the nations of South Asia. SARI/Energy is sponsored by the U.S. Agency for International Development (USAID). The objectives of the technical assistance component of the SARI/Energy program are to:

- Assist the local standards institutions to understand the benefits from energy efficiency standards and labeling
- Communicate the role and benefits from EE standards in competitive markets
- Develop a mechanism and network for regional standards setting
- Evaluate the benefits from regional testing facilities and recognize regional testing bodies for labeling to support EE standards and
- Establish a monitoring process to determine impacts

This report supports the goals of the technical assistance effort in the development of mechanisms for harmonization of policy elements between the countries in the region.

[1] Reported in Concept Paper – Energy Efficiency Standards and Labeling for Appliances – Nepal. USAID

Report Objectives

The South Asian Regional Initiative for Energy (SARI/Energy) calls for a series of activities to promote Energy Efficiency Standards and Labeling (EES&L) of end use appliances in the region. In pursuit of this goal, the project supports several seminars and meetings that bring together policymakers and stakeholders from throughout the region. The purpose of these gatherings is to encourage a dialogue among participants as to the benefits and barriers associated with EES&L programs. In addition, it is the role of the program organizers to provide participants with the technical details necessary to make progress towards effective efficiency programs.

One component of the initiative is to encourage the harmonization (alignment) of existing program components, and the pursuit of new programs coordinated at the regional level. In support of this goal, the report provides information aimed at motivating and enabling cooperative activities which will provide concrete benefits to programs in each country, whether well developed, or still in the initial planning stage.

It should be emphasized that the underlying objective of the harmonization component of the SARI/Energy project is to increase the potential for success of EES&L programs of all countries involved, and to reduce burdens on manufacturers, exporters and importers in each country. Harmonization 'for it's own sake' is not desirable, nor is it suggested that policymakers should bring their programs in line with international norms if doing so would present a disadvantage to their own efficiency programs, or to commercial interests within their country. If there is no such disadvantage, however, the program encourages alignment of policies and provides a forum at which this alignment can be pursued.

The report covers several main topics, with varying emphasis. First, a general discussion of the motivation for an explicit policy of regional harmonization is given. Next, the current status of existing programs in the region are discussed in some detail. The section that follows covers the harmonization of efficiency test procedures. Special attention is given to this component of an EES&L program because it is the most critical element in terms of harmonization – having incompatible test procedures between trade partners can greatly impact the effectiveness of a program, and it can also unduly impact trade. Currently, policymakers in India and Sri Lanka are collaborating with the goal of aligning refrigerator test procedures used in their respective programs. For this reason, the section on test procedures of refrigerators goes into a significant amount of technical detail, in order to provide the clearest possible articulation of issues to be resolved in bringing the procedures into alignment. Following the discussion of test procedures, the report contains a section each on harmonization of efficiency rating levels, development of label designs, and enforcement issues.

The report is organized such that the sections covering current programs and test procedures are subdivided by target appliance. These sections are further divided by country, where applicable. Each section is concluded with recommendations.

Summary of Recommendations

Based on known usage patterns and sales growth rates in the region, the following appliances should be considered for regional standards harmonization:

- Fluorescent Lamp Ballasts
- Compact Fluorescent Lamps
- Refrigerators
- Room Air Conditioners
- Ceiling Fans

Policymakers in Bangladesh, India, Nepal and Sri Lanka have expressed interest in developing programs for all of these products. In addition, within the region there is some experience in developing a program for all of them. Some of these programs have been in operation for several years, while others have completed the development stage and will soon be launched. It is the general recommendation of this report that one or more **working groups** be formed between representatives of the four countries in order to do the following:

1. Investigate the potential to align existing test procedures with international norms, and develop new programs at the regional level based on harmonized test procedures.
   - Elements Targeted for Harmonization – Refrigerator Test Procedures
   - Programs Targeted for Regional Expansion – Fluorescent Lamp Ballasts, Compact Fluorescent Lamps, Refrigerators and Air Conditioners
   - Program to be Initiated at Regional Level – Ceiling Fans

2. Exchange best practices and lessons learned between countries having programs and those who are currently considering or planning programs. Examples of experiences from which policymakers throughout the region can gain are:
   - Enforcement Issues – Sri Lanka Lighting Program and India Refrigerator Program
   - Development of Labels - Sri Lanka Lighting Program and India Refrigerator Program
   - Market Data Collection – India Refrigerator Program

3. Investigate the possibility of accelerating program development through the sharing of test facilities through the mechanism of Mutual Recognition Agreements.
   - Candidate for Investigation – Air Conditioning

Section 1 Introduction

1.1 Benefits of Regional Harmonization

As policy makers begin or expand implementation of an efficiency program for energy-consuming appliances, there are many issues to consider, and many options. Decisions made will determine whether the program is successful according to the energy goals of the governments of the region. One important resource at the disposal of decision makers is the real-world experience gained in similar programs throughout the world, some of which have been in place for decades, others of which are still in early stages. These programs all share some general characteristics, but diverge significantly in the details, according to the particular situation and goals of each country. A government newly embarking on such a program therefore has the opportunity to adopt appropriate elements from other programs, or modify others.

In particular, this report discusses the benefits provided by exchange between representatives of Bangladesh, India, Nepal and Sri Lanka, and the "regionalization" of programs which are already implemented in one or more of these countries. The report refers to both the expansion of programs to a regional level, and to the alignment of program elements (notably test procedures) as "harmonization". Its aim is to give resource information regarding the current state of affairs as it affects the development of regional programs at this time. In particular, it discusses the consequences of alignment of some program components with regard to international trade of electrical appliances.

Possibly a useful description of what is meant by harmonization is (and isn't)[2] given by the following:

> Harmonization "does not require standards to be identical, but differences will generally be due to requirements based on logic or real need, not on habit or prejudice - For example, difference of voltage or frequency, climate, seismic activity or legislative practices".

In addition to the differences mentioned above, there may also be differences in appliance markets - the presence or non-presence of domestic manufacturers, the range of sizes of manufacturing / importing enterprises, local purchasing behavior, the economic level of consumers and, not least, the particular goals of the efficiency program, which may differ between governments. In creating a successful program, an assumption that "one size fits all" is not advisable.

Harmonization or alignment also has a different meaning depending on the status of the efficiency program in the countries involved. On one hand, economies with well-developed energy efficiency programs for appliances have been encouraged to bring their

[2] Harmonization of Standards – The Australian and New Zealand Experience. David Cogan. CLASP Symposium – Lessons Learned in Asia: Regional Symposium on Energy Efficiency Standards and Labeling 2001.

programs into better alignment for the purposes of promoting free trade. This means that different existing standards are made to agree by modifying the specifications of one or both existing programs. On the other hand, for governments who are in the early phase of initiating a program, harmonization can refer to the selection of procedures and practices from the list of already existing programs throughout the world. The decision of which procedures to adopt from which other countries will be determined by which best match the situation and goals of the adopting country, and the trade patterns between the two.

There can be a significant advantage to adopting program components according to what is already in use in other countries. The most obvious advantage involves the time and resources necessary to develop a complex program. It should not be necessary to repeat all of the research which has previously been done by others, rather it may be possible to benefit from the experiences of others by finding out about the successes and challenges they had. Adopting relatively generic aspects of the program from the practice of others may free up resources to concentrate on those areas for which individual consideration should be paid by any country. An example of this would be to adopt a well-accepted test procedure for a particular product, and use the saved resources on evaluating consumer's reaction to a certain public announcement campaign. For this reason, harmonization of some aspects would likely speed up the process of building labeling and standards programs in the region.

Some of the first economies to design programs designed their own test procedures, labels and energy levels (for both Minimum Efficiency Performance Standards MEPS, comparative and endorsement). More common among the more recent programs is to adopt the procedures of an earlier starter who is also a trade partner. For example Mexico has adopted many of the procedures of the United States. Another option is to adopt standards specifically developed to be international, such as those developed by the International Standards Organization, or ISO. Many Asian countries use ISO procedures, and in particular Thailand (a major exporter to SARI countries) has recently made an explicit goal to bring all test procedures into alignment with ISO standards.

In addition to the efficiency of implementation afforded by adopting widely accepted test procedures and standards, alignment of labeling and standards policies can help reduce barriers to trade. In fact, harmonization is often framed explicitly in terms of free trade, such as in the case of the North American Energy Working Group, a NAFTA-related project to align efficiency standards of Canada, Mexico and the United States. In Europe, two countries, Denmark and the Netherlands each proposed mandatory efficiency programs, which were rejected by the European Commission (EC) as representing an obstacle to free trade within the continent. Subsequently, the EC has implemented a series of EU-wide directives covering appliance efficiency.

Section 2 Target Appliances and Current Status of Regional Programs

Table 2-1 lists programs currently in place in Asian countries, including India and Sri Lanka, as well as many significant trading partners of countries in the SARI region.

Table 2-1 Labeling Programs in Asia

Product	China		Hong Kong		India		Japan		Korea		Philipplnes		Singapore		Sri Lanka		Ch. Taipei		Thailand	
	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E
A/C - Central									M					V						
A/C - Room			V		V_P		M		M		M			V				V	V	V
A/C - Split	V		V						M		M							V		
Ballasts					V_P				M					V	V					V
Clothes Dryers			V											V						
Clothes Washers			V						M					V				V		V
CFL			V		V_P				M		M				V					
Fans															V_P					
Freezers		V					M				M							V		
Heat Pumps									M											
Lamps		V	V	V	V_P	V	M		M	V				V				V		V
Motors						V				V				V						V
Pumps										V										
Refrigerators	V		V		V_P	V	M		M		M			V	V_P			V	V	V
Television						V												V		
Water Heaters					V_P	V								V				V		

C = Comparative / E = Endorsement
V = Voluntary / M = Mandatory
V_p – Voluntary Proposed

There are several considerations to be taken into account in assessing which appliances to target for an efficiency program. As the program has as its goal the maximum reduction in load, it is most logical to first address the efficiency of those appliances using the most energy. A secondary consideration may be the potential for efficiency improvement of the appliance, that is, whether there exists an affordable technology replacing that currently used in the country. Finally, labeling should be considered for products for which implementation requires a minimum of resources, due to the pre-existence of test procedures and facilities.

2.1 Fluorescent Ballasts

As Figure 2-1 shows, lighting is a very significant component of peak demand in Bangladesh, causing a sharp increase in electricity demand after sunset, and gradually decreasing in the early morning hours. Loads for the other countries in the SARI region also show a significant increase in peak demand due to lighting.

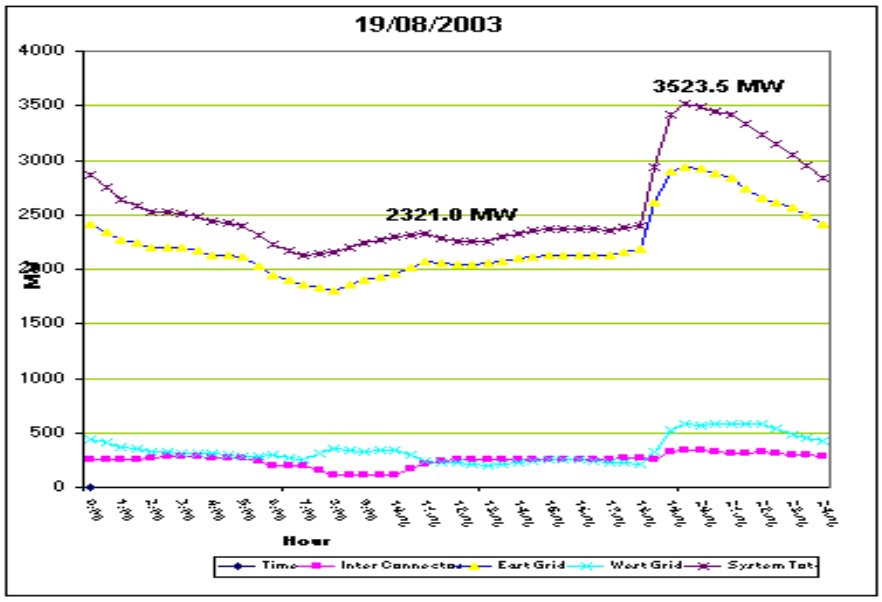

Figure 2-1 Bangladesh Daily Demand Curve - Reference Bangladesh Power Development Board http://www.bd-pdb.org/load.htm

For many lower income households in the region, lighting is the only use of electricity, and remains the most significant use of power for those households with some appliances. In Nepal, for instance, it is estimated that roughly half of households with access to electricity use it for lighting only. In general, most residential lighting is accomplished with incandescent bulbs, but fluorescent tubes are also common. In Bangladesh and Nepal, it is estimated that roughly **10%** of lighting is provided by fluorescent tubes. On the other hand, in Sri Lanka, a 1999 survey of urban households indicates that **64.2%** of households use 4 ft fluorescent tubes and **29.1%** use 2 ft tubes. Due to the contribution of lighting to peak demand, and because of the high potential for efficiency improvement, lighting products are a logical first target of efficiency programs in the SARI region.

2.2 Sri Lanka Fluorescent Lamp Ballast Program Status

Authorities in Sri Lanka have had an efficiency labeling program for lighting products for several years. The facilitating authority in that country is the Demand Side Management Branch of the Ceylon Electricity Board (CEB) in liaison with the Sri Lanka Standards Institute (SLSI), which also acts as the certification authority, and the testing institute for testing ballasts in the labeling program. The DSM branch of CEB was established in 1995. In 1999, a household survey was performed, and a feasibility study for a standards and labeling program was completed in 2000. Phase 1 of the labeling program addresses

magnetic ballast efficiency. Ballasts are labeled by suppliers on a voluntary basis according to rating scheme shown in Table 2-2 and 2-3.

Table 2-2 Star Ratings for Ballasts Used for 18/20W Fluorescent Lamps

Percent Active Power Loss	Active Power Loss	Star Rating
$P_{\%} \leq 20$	$P \leq 4$	* * * * *
$20 < P_{\%} \leq 25$	$4 < P \leq 5$	* * * *
$25 < P_{\%} \leq 30$	$5 < P \leq 6$	* * *
$30 < P_{\%} \leq 35$	$6 < P \leq 7$	* *
$35 < P_{\%} \leq 45$	$7 < P \leq 9$	*
$45 < P_{\%}$	$9 < P$	No Star

$P_{\%}$ = Percentage active power loss in ballast; P = Active power loss in ballast in watts
Additional note: The standard notes that "all electronic ballasts that conform to recognized international standards (IEC 928 and 929) shall be labelled with ' * * * * * ' (five star) rating."
Source: SLS 1200: 2001

Table 2-3 Star Ratings for Ballasts Used for 36/40W Fluorescent Lamps

Percent Active Power Loss	Active Power Loss	Star Rating
$P_{\%} \leq 10$	$P \leq 4$	* * * * *
$10 < P_{\%} \leq 15$	$4 < P \leq 6$	* * * *
$15 < P_{\%} \leq 20$	$6 < P \leq 8$	* * *
$20 < P_{\%} \leq 25$	$8 < P \leq 10$	* *
$25 < P_{\%} \leq 30$	$10 < P \leq 12$	*
$30 < P_{\%}$	$12 < P$	No Star

$P_{\%}$ = Percentage active power loss in ballast; P = Active power loss in ballast in watts
Additional note: The standard notes that "all electronic ballasts that conform to recognized international standards (IEC 928 and 929) shall be labelled with ' * * * * * ' (five star) rating."
Source: SLS 1200: 2001

The results of this program to date are the labeling of 7 models of ballast, which are distributed by 6 different importers. Of these, 6 models are rated "3-star" and one is rated "4-star". However, it is reported that only **20%** of the 1.2 million ballasts imported to the country per year participate in the labeling program at present[3].

2..3 Nepal Ballast Program Status

The Government of Nepal has chosen fluorescent lamp ballasts as its first target product for developing an efficiency labeling program. Towards this goal, a national technical committee has been established with responsibility for setting energy efficiency standards and labeling for lighting appliances. Institutions represented include the Nepal Bureau of Standards and Metrology (NBSM), Nepal Electricity Authority (NEA), Federation of Nepal Chambers of Commerce and Industry (FNCCI), the Ministry of Industry, Commerce and Supplies, and Ministry of Science and Technology, among others. In

[3] Personal communication with DSM Division of CEB

addition, the following actions have been taken:

- An information exchange with Sri Lanka has taken place
- A market survey has been completed
- The standard setting process has begun

The results of the market survey indicate that 400,000 ballasts are sold in Nepal each year, the majority of which are imported from India and China. For this reason, regulators in Nepal strongly prefer that lighting standards developed there be compatible with those in place in India and China. There are 8 major brands of ballasts. Generally, products are found to be very inefficient, with losses from 8 to 10 Watts.

2..4 Recommendations – Fluorescent Lamp Ballasts

A program for efficiency labeling of fluorescent lamp ballasts is an attractive target for regional harmonization. In particular, fluorescent lamp ballasts are used widely in the residential, commercial and industrial sectors, and experience shows that efficiency can be improved significantly and cost effectively.

Sri Lanka already has a successful program labeling fluorescent lamp ballasts, and Nepal has identified this product as the first to address in a labeling program which is just beginning. Lighting products are already widely tested for safety and other performance factors, making the establishment of test facilities and procedures for lighting efficiency relatively straightforward and less expensive than some other products.

For these reasons, we recommend the convening of a working group among the implementing agencies of the countries within the SARI region in order to assess the desirability, feasibility and investment needed to implement a program of fluorescent ballast efficiency labeling in Bangladesh, India and Nepal.

2.5 Compact Fluorescent Lamps

The promotion and labeling of compact fluorescent lamps (CFLs) is clearly one of the most cost effective efficiency programs available, for several reasons. First, compact fluorescent lamps replace incandescent lamps, which are currently used in virtually every household which has access to electric power. Second, the efficiency improvement afforded by this technology is very large, using only a third of the power to provide the same illumination. Though CFLs cost significantly more than incandescent lamps, the payback period to the consumer is very short. Finally, replacement of incandescent bulbs with CFLs directly impacts peak demand.

2.5.1 Sri Lanka CFL Program Status

Phase Two of the efficiency labeling program in Sri Lanka concerns the promotion, testing and labeling of compact fluorescent lamps (CFLs). The labeling phase of the CFL program was officially launched earlier this year with the participation of the Honorable Ministry of Power and Energy, and all stakeholders (around 10) in March 2003.

The CFL program in Sri Lanka has a history going back several years, with a promotion project led by the Ceylon Electricity Board (CEB). This program began with the bulk purchase of 100,000 CFLs in 1995-1996. Following this, CEB began to distribute certified CFLs to utility customers, offering interest-free payment over the course of the year, to be collected as part of utility bills (Easy Payment Plan). It is estimated that 300,000 CFLs have been distributed through this program to date, either via CEB, or directly from manufacturers/suppliers. Sales of CFLs through the promotion program and total sales are shown in Table 2-4

Table 2-4 Sales of Compact Fluorescent Lamps in Sri Lanka

Year	CFL Loan sales	Direct Sales	Total Sales
1997 -1999	133,464	813,952	947,416
2000	89,114	420,732	509,846
2001	60,697	374,187	434,884
Cumulative	**283,275**	**1,608,871**	**1,892,146**

This certification program has since developed into a "star" labeling program, based on efficacy and power factor. The rating levels of this scheme are shown in Table 2-5. This rating scheme will be subsequently linked directly to the promotion scheme through the requirement that only those products rated with three stars or better (out of five) will qualify for the easy payment scheme. Product lifetime is also covered in the promotion program, since a minimum warranty of one year is required in order to qualify. Currently, 26 CFL models provided by 8 importers and one manufacturer are labeled according to the five star system.

Table 2-5 Star rating for Compact Fluorescent Lamps in Sri Lanka

Performance Grading	Star rating
PG>70	Five Star
65<PG≤70	Four Star
60<PG≤65	Three Star
55<PG≤60	Two Star
50<PG≤55	One Star
PG≤50	No Star

Source : SLS 1225:2002

2.5.2 Recommendations – Compact Fluorescent Lamps

The experience of the CFL program in Sri Lanka can be an extremely valuable resource for implementing agencies in the other countries in the SARI region, since it encompasses all the elements of a successful program: testing, label design, enforcement and promotion. The number of energy efficient products put on the market throughout this program is a demonstrable measure of success. We recommend that a working group be formed to discuss and coordinate possibilities of pursuing similar programs throughout the region. Elements of this discussion should include:

- Adoption of uniform regional test procedures
- Successful strategies and barriers to program promotion
- Successful strategies and barriers to certification and enforcement schemes

2.6 Refrigerators

Refrigerators are a natural target of efficiency programs for the following reasons:

- They are generally one of the first major appliances purchased as household incomes permit, and therefore ownership rates are relatively high
- They are in operation throughout the day, and consume a large amount of total electricity
- Options for improvement of efficiency are readily available to manufacturers and very cost effective for consumers

There is already a very large market for refrigerators in India, with about 3 million units sold every year. Seven major manufacturers compete in the organized sector, and large multinational manufacturers have recently entered the market as well. Currently, the market is dominated by direct cool appliances, with frost-free units capturing only about **15%** of sales. The most typical model has a capacity of 165 liters. There are various estimates of the future growth rate of refrigerator sales in India. According to one report[4], sales growth was **16%** between 1995 and 2000. Future growth may be somewhat lower, however, as the market becomes saturated.

Ownership rates of refrigerators in urban homes in Sri Lanka are about **70%**, and sales growth rates are at the **10%** level[5].

According to industry estimates, there are currently about 250,000 refrigerators installed in Bangladesh households. Import data[6] indicate an import growth rate of about **30%**

[4] USAID EMCAT-DSM – Appliance efficiency market research report prepared by IRG and Taylor Nelson referenced in "GHG Emissions Reduction Estimation", USAID and USEPA, sponsors.
[5] LBNL – "Feasibility of an Appliance Energy Testing and Labeling Program for Sri Lanka"
[6] UN Comtrade Data – UNDESA – July 2003

since 1990, with imports of refrigerators reaching about 12 million $US in 2001. In Nepal, data indicate a growth rate of about **20%** between 1996 and 2001.

India and Sri Lanka have already begun to address the consumption of their large stock of refrigerators by developing an efficiency labeling program. The current load due to refrigerators in Bangladesh and Nepal is probably considerably smaller than the load due to residential lighting. There is nevertheless strong motivation to consider implementation (or harmonization) of refrigerator efficiency standards at an early stage, given the potential growth in this market, which would make refrigerators a significant energy consumer in the residential sector.

2.6.1 India Refrigerator Program Status

A Standards and Labeling program for refrigerators in India is already well developed. In fact, manufacturers in India are expected to begin distributing labeled products in early 2004. Initially, only frost-free refrigerators will be labeled by manufacturers. These will be followed by direct cool refrigerators, then by air conditioners.

The focus of the project, led by the Indian Bureau of Energy Efficiency (BEE) has been a voluntary comparative label for refrigerators and air conditioners. To date, the following activities have been completed, or are in progress:

- An extensive market study leading to an adopted design for comparative labels
- Creation and convening of Technical and Advisory Committees to develop standards and protocols
- Development of refrigerator test procedures
- Upgrade and accreditation of test facilities for refrigerator tests[7]
- Development of enforcement mechanisms for a labeling program (detailed in Section 6)
- Market survey and test data collection to assess efficiency levels and energy level ratings (in progress)

2.6.2 Sri Lanka Refrigerator Program Status

Refrigerators have been identified as a candidate for the labeling program facilitated by the CEB in liaison with the SLSI. As part of SARI/Energy's harmonization project, Sri Lanka has agreed to pursue alignment of refrigerator test procedures with those being proposed by BEE as part of the Indian program. The details of refrigerator test procedures, and the current difference between procedures used in India, in Sri Lanka, and international procedures are given in Section 4.3. A testing facility is expected to be in operation in early 2004 funded by the World Bank. The target for program implementation is June of 2004.

[7] Currently independent labs are in development at ERDA, ERTL, CPRI, CERC and ITS

2.6.3 Recommendations - Refrigerators

There is already a large degree of regional cooperation with a specific emphasis on harmonization of refrigerator test procedures. To this end, representatives of each country in the SARI region met to discuss ways in which refrigerator standards might be brought into alignment. Discussion of test procedures for refrigerators is ongoing. The technical details of current differences in the procedures used in India, in Sri Lanka, and other international protocols are given in Section 3.3.

The advanced status of a refrigerator labeling program in India provides a significant opportunity for the other countries in the region to benefit from the Indian experience. Some of the areas for which a peer exchange may be highly beneficial are the following:

- Label Design Project – An extensive program undertaken in 1998 and 1999 to develop an efficiency label. This work represents a wealth of experience on how to develop labels to attract local consumers, including conducting focus groups and sampling households.
- Data Collection Project – Currently BEE is pursuing a data collection project, including market, engineering, usage, ancillary and behavioral data. There will be valuable lessons from this project for the other countries in the region. Lessons will include effective methodologies for collection and processing of the data, and in the ways that this data can be used as part of the project design process. We recommend a regional working group to adjourn once the data collection is completed, in order to help each country to design and implement its own data project.

2.7 Air Conditioners

Currently, the number of air conditioners operating in homes is small throughout the region. Contributing factors to low ownership rates are the high price of equipment and the high operating expense. Air conditioning is more common in the commercial sector, but still limited. Air conditioning presents a situation similar to refrigerators therefore. Saturation rates are low, but the energy intensity of the appliance is very high (on the order of 1000 W). Therefore, a rapid increase in saturation of this appliance could make it a significant energy consumer.

2.7.1 India Air Conditioner Program Status

In India, refrigerator and air conditioner labeling programs have been developed in parallel. Implementation of air conditioning labels is expected to closely follow behind that of refrigerators, which is scheduled for early 2004. The list of activities completed or in progress is similar to that of refrigerators:

- An extensive market study leading to an adopted design for comparative labels

- Creation and convening of Technical and Advisory Committees to develop standards and protocols
- Development of test procedures for air conditioners
- Construction of test facilities for air conditioners (in progress)
- Development of enforcement mechanisms for a labeling program (detailed in Section 6)

Test facilities for air conditioning efficiency are generally more sophisticated and expensive to build than those for refrigerators. The Indian Bureau of Energy Efficiency (BEE), with substantial input provided by its Advisory and Technical Committees, has decided to adopt the Balanced Calorimeter test procedure described in ISO 5151 for the labeling program. Currently, there are no test labels in India equipped to perform this procedure. With assistance from BEE, two independent organizations are developing air conditioner test facilities.

2.7.2 Recommendations – Air Conditioners

Two factors distinguish air conditioners from other appliances when it comes to developing an efficiency labeling program. The first is that ownership rates in the residential sector may be low, but sales rates are growing. This means that for some economies, air conditioning may not be currently a large consumer, but may become one in the future. Second, testing facilities for air conditioners are quite expensive compared to facilities for other appliances. This impacts the feasibility of initiating a program with test labs in every country.

For these reasons, we suggest that a working group be established to follow the progress of the construction of air conditioner test facilities in India. This group should investigate the desirability and feasibility of initiating labeling programs for air conditioning in Bangladesh, Nepal and Sri Lanka, with the use of Indian test labs for verification purposes, using the vehicle of mutual recognition agreements (MRAs), until such time as test labs can be built in each country. This would have a significant benefit for countries initiating a program because they could do so without a large initial capital expenditure. It might also have a benefit for those organizations building test labs in India, by increasing the amount of tests requested of them, thus increasing the income flow related to their initial investment.

2.8 Ceiling Fans

Fans are also a significant consumer of energy in the countries of the SARI region. Residential air conditioning ownership is low in these countries, but most homes use fans for ventilation. For example, according to a 1999 household survey in Sri Lanka, nearly every urban household used electric fans, and generally households contained several fans. On average, fans accounted for 170 Watts per household when they were all operating.

2.8.1 Status of Sri Lanka Ceiling Fan Program

Sri Lanka is currently developing a labeling program for Ceiling fans as part of their overall labeling program which includes lighting products and refrigerators. Ceiling fans are widely used in Sri Lanka as means of achieving thermal comfort in domestic, commercial and industrial environments. There is a large number of brands and varieties in the local market supplied by about 20 major importers. Thus the necessity to evaluate their performance in terms of energy use and otherwise is crucial. There are no very well established performance indicators for this purpose. Moreover there is as of this time no test facility, but one is to be constructed using local funding from the Energy Conservation Fund (ECF).

University of Moratuwa is assigned to develop a proper testing procedure, identify suitable performance indices and methodology of star rating. This testing procedure will be an enhanced version of the ones available at present in some countries in the region. The goal for implementation of this program is the end of 2004.

Section 3 Harmonization of Test Procedures

Any energy efficiency standards and labeling program depends on an accurate and verifiable assessment of energy consumption, whether the program is voluntary or mandatory and endorsement or comparative label, or minimum efficiency performance standards (MEPS).

It is generally the responsibility of the provider (manufacturer / importer) to test appliances. In the case of a manufacturer providing to a purely domestic market, only one test has to be performed, namely the procedure specified by the government of the one country involved.

Testing can be expensive, costing hundreds of dollars per model tested. This can have negative consequences for the success of a program for two reasons. In a voluntary program, the increase in public awareness of efficiency depends on the participation of manufacturers in the program. Manufacturers who sell products in their own country may have to test according to one procedure in order to participate in their country's program. If they must test the same product with a different procedure in order to export to another country, their testing costs will double, possibly leading them not to participate in the program of the country they export to. In the extreme case, a manufacturer exporting to several different countries all with different test procedures would have to build a testing lab which could accommodate all the different procedures, and test each model that many times. This additional cost may discourage manufacturers from participating in an efficiency program or they may participate but pass on the extra cost to the consumer in the form of higher retail prices. For this reason, harmonization of test procedures is particularly beneficial to countries having either a large import or export market.

3.1 Fluorescent Lamp Ballasts

Test procedures for lighting products generally include many performance factors, and are not focused primarily on energy efficiency. Usually however, a metric for efficiency can be derived from the parameters measured. Testing procedures used in Asia are usually make reference to those provided by the International Electrotechnical Commission (IEC), although in some cases these procedures are simplified or otherwise modified

The test procedures IEC60921 covers performance of magnetic lamp ballasts, while IEC60629 covers electronic ballasts. These procedures or procedures similar to them are widely used. The performance requirements included do not explicitly mention efficacy, but they measure lumen output and power consumption, which can be compared to a reference system. Table 3-1 lists some of the countries in Asia which currently conduct testing on fluorescent lamp ballasts, along with the procedures they use.

Table 3–1 Ballast Test Procedures

Country	Procedures	Mag./ Elec	Comments
Chinese Taipei	CNS927-96/CNS3888	M	Similar to IEC60920/ IEC6092
Japan	KS8102	M	Included in Fluorescent Lamp
Korea	KS8100	E	Equivalent to IEC 60929
Malaysia	MS141	M	Reference IEC 60921
Phillipines	PNS 12-2: 1996	M	Equivalent to IEC 60921
Singapore	SS491:2001	M	Reference IEC60921
	SS380:1996	E	Reference IEC60929
Sri Lanka	SLS 1200:2001	M/E*	Similar to IEC 928/929
Thailand	TIS23-2521	M	Broadly equivalent to IEC6092
	TIS1506-2541	E	Broadly based on IEC60929
Vietnam	TCVN 6479:1999	E	

Source : Harrington et al- Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies, APEC-ESIS Website

E*- Electronic ballasts are given Five stars without testing

3.1.1 Sri Lanka Fluorescent Lamp Ballast Testing Program

Ballasts are tested according to the standard SLS 1200:2001. This is the 1st revision of SLS 1200:1999 and this revision is affected to incorporate requirements for star ratings for ballast used for fluorescent lamps of 18/20W. This sets out guidelines for energy efficiency labeling of ballasts used for 18/20 W and 23/40 W fluorescent lamps. Ballast Watt loss is tested and certified by the test lab of Sri Lanka Standards Institution (SLSI). The procedure used is a simplified version of the procedures specified by IEC (928/929). In particular, the testing facilities are lacking reference lamps, which are required in order to comply with the IEC procedures. Currently, only magnetic ballasts can be tested with the procedure used. However active power loss in electronic ballast tends to be relatively low and all electronic ballasts conforming to recognized international standards (IEC 928/929) shall be labeled with 5 stars.

3.1.2 Recommendations – Fluorescent Lamp Ballast Test Procedures

India, Nepal and Bangladesh currently do not have programs developed explicitly for efficiency labeling of fluorescent lamp ballasts. Facilities for testing of these products do exist however, where products are tested for other criteria. It is likely relatively straightforward to develop testing facilities in these countries that could perform the procedures required for a labeling program.

We recommend that representatives of each country coordinate with each other and with whatever institutions exist which might develop testing facilities for a labeling program of fluorescent lamp ballasts. The initial goal of this effort should be the assessment of investment necessary to develop testing facilities. Due to the abundance of trade of these

products, both within the SARI region to and from other Asian countries, it is preferable to adopt internationally recognized test procedures. An additional task would therefore be to assess the willingness of regional parties to adopt these procedures, and the feasibility of upgrading any existing facilities to be able to perform them.

3.2 Compact Fluorescent Lamp Test Procedures

Compact Fluorescent Lamps are much more energy efficient than incandescent bulbs. The IEC test procedure, IEC90969 tests for wattage, luminous flux, color, lumen maintenance and life. Of these, the length of product life is significant, since CFLs are much more expensive than incandescent bulbs, and inferior products are thought to have a shorter lifetime. Hong Kong, Korea, the Philippines, Singapore, Sri Lanka and Thailand currently test CFLs.

Table 3-2 Compact Fluorescent Lamp Test Procedures

Country	Procedure	Comments
Hong Kong	IEC60901, IEC90969	
Korea	KS C7621	Based on KS C8100 and KS C7601, as parts of IE60969
Philippines	PNS 1261:1995	Reference IEC 60969
Singapore		Reference CIE84:1989
Sri Lanka	SLS 1225:2002	Reference IEC 969:1988, JIS C7607:1991 & CIE 84:1989
Thailand	TIS 236-2533	Reference IEC 60081

Sources: Harrington et al - Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies, APEC-ESIS Website

3.2.1 Sri Lanka Compact Fluorescent Lamp Testing Program

There are two facilities available for performance testing of CFLs in Sri Lanka. One is located at the Moratuwa University, which can report only illuminance levels, and corresponding intensities, while the other is at the National Engineering Research and Development (NERD) Center. The NERDC facility can take spectral and photopic measurements, and measure total lumens, spectral energy distribution, color temperature, chromacity coordinates, and color rendering indices. The current testing procedures are in alignment with international IEC 969:1988, JIS C7607:1991 and CIE 84:1989 procedures.

3.2.2 Recommendations – Compact Fluorescent Lamp Test Procedures

Recommendations for harmonization of test procedures of compact fluorescent lamps are similar to those for fluorescent lamp ballasts. It is clear that all countries in the region could benefit significantly from an efficiency labeling program for CFLs, and also that there is a significant amount of trade of these products within the region, and throughout Asia. Therefore, in order to decrease the burden of manufacturers that provide these

products to more than one country in the region, it is in the interest of all parties to adopt a uniform test procedure. Without deeper investigation, the logical choice for such a procedure seems to be an international one, but the interested parties must carefully evaluate if uniform adoption of such procedures is truly desirable and / or feasible. These questions should be the task of a working group parallel to that recommended to investigate test procedures for fluorescent lamp ballasts.

3.3 Refrigerator Test Procedures

There are three main types of domestic refrigerating appliances used designated according on the design and temperature levels maintained in the cabinets. These are:

- Direct Cool Single / Double Door Refrigerators (With and Without low Temperature Compartment)
- Direct Cool Single / Double Door Refrigerator – Freezers
- Forced Air Circulation Single / Double Door Refrigerator - Freezers

Currently the Indian refrigerator market is dominated by direct cool appliances, which hold a market share of more than **85%**.

There are at present three ISO standards viz. ISO 7371, ISO 8187, and ISO 8561. These standards are not country specific but are developed in consultation with representatives from ISO member institutions from around the world. In general, refrigerator test procedures used in Asia are based on the ISO protocols, as shown in Table 3-3. In particular, Thailand, which has a well-developed EES & L program and is a significant exporter to the SARI region, has adopted an explicit policy of alignment with ISO standards.

Table 3-3 Refrigerator Test Procedures

Country	Test Procedure	Based on	Comment
China	GB 12021.2-89	ISO 7371-8561	
India	IS 1476	ISO 7371/8561/8187	BEE Procedure in Draft
Indonesia	SNI 05-3086:1992	ISO 7371/8561/8187	Voluntary Labeling Program
Korea	KS C 9305-96		Not Equivalent to other Standards
Malaysia	MS ISO:8561/8187	ISO 7371/8561/8187	
Philippines	PNS 1474-1477	ISO 7371/8561/8187	
Chinese Taipei	CNS 2062 & CNS 9577		Similar to ISO 5155, 7371, 8187
Thailand	TIS 455-2537	ISO 7371/8561/8187	Does not appear to differ significantly from ISO
Singapore		ISO 7371/8561/8187	
Sri Lanka	SLS 1230:2003	ISO 7371/8561/8187	Draft

Sources: Harrington et al - Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies, APEC-ESIS Website

Currently, ISO standards for refrigerators are under review, and it is likely that, before the end of 2003, new standards will be issued. No significant changes to the test procedures are expected from this revision, but the three procedures are expected to be combined into a single one covering all product classes. In the longer term, there is an effort to produce a significantly improved ISO standard, which takes into account the comments of representatives of all member countries. This process promises a significant improvement in the test procedures, but is expected to take several years.

In addition to the international protocols there are quite a few country specific standards such as Australia New Zealand Standard (AS/NZS 4474), Indian Standard (IS1476), draft BEE (Indian Standard), Draft Sri Lanka Standard SLS 1230:2003, U.S. National Standard (ANSI/ AHAM HRF), Chinese National Standard (CNS2062), Japanese Industrial Standard (JIS-C 9607), Canadian Standard (CAN/CSA) and European National Standard (EN 153). Bangladesh has drafted refrigerator test procedures in alignment with ISO, called BDS-ISO 7371:2003.

The country specific standards generally serve only the domestic market rather than the international. It may be worthwhile to harmonize standards within the region so that consumer is able to compare the products properly. The following are the relevant Standards for refrigerators with and without low temperature compartment and Refrigerator Freezers

- ISO 7371: 1995 (Refrigerators with and without low temperature compartment)
- ISO 8187: 1995 (Refrigerator-freezers)
- ISO 8561: 1995 (Frost free refrigerators, refrigerator – freezers and freezers)
- AS/NZS 4474.1:1997 (Refrigerating appliance)
- IS 1476.1:2000 (Refrigerators with or without low temperature compartments)
- BEE, Draft Indian Standard (Direct cool and forced air circulation refrigerators-freezers)
- SLS 1230:2003, Sri Lanka Draft Standard (Refrigerator, refrigerator - freezers and freezer)

The following are key elements of the refrigerator test protocols, and these elements which require being brought into alignment in order to allow direct comparison of test results.

- Gross volume measurement
- Temperature protocols
- Humidity, test period and freezer test load

3.3.1 Gross Volume Measurement – Direct Cool Appliances

Table 3-4 shows a comparison of gross volume measurement for direct cool appliances. It can be seen that all the standards have the same procedures for measuring the gross

volume except the IS 1476 where water-filling method is used to determine the gross volume.

Table3 -4 :Gross volume Measurement – Direct Cool Appliances

ISO 7371 / BDS-ISO 7371	Dividing the total volume into convenient units of volumes of easily measured geometric shapes. Internal fittings such as shelves, removable partitions, containers evaporators thermostats and interior light housings shall be considered as not being in place. Shall contain exact shapes of the walls if they contain depressions or projections.
ISO 8187	Same as ISO 7371
AS/ NZS 4474	Same as ISO 7371
IS 1476	▪ Same as ISO 7371 ▪ Use water filling method to determine gross volume
Draft BEE Standard (India)	Same as ISO 7371
Draft SLS 1230:2003	Same as ISO 7371

3.3.2 Gross Volume Measurement – Frost-Free Appliances

Table 3-5 shows a comparison of gross volume measurement in case of frost-free refrigerator-freezers. All of the standards have the same procedures for measuring the gross volume, with the exception of the inclusion or exclusion of *inaccessible volume because of air ducts, fans, evaporators and other associated accessories*. This is an important difference, since energy efficiency ratings are generally scaled by gross volume. A difference in volume measurement therefore prevents direct comparison of efficiency ratings.

Table 3-5 Gross volume Measurement - Frost Free Appliances

ISO 8561	Same as ISO 7371 and in addition "Any volume, which is inaccessible because of air ducts, fans, evaporators and other associated accessories shall also be deducted."
AS/NZS 4474	Same as ISO 7371, in addition to that "Any volume, which is inaccessible because of air ducts, fans, evaporators and other associated accessories shall also be included if it is with in the space bounded by the liner otherwise excluded
Draft BEE Standard (India)	Same as AS/NZS 4474
Draft SLS 1230:2003	Same as ISO 8561

3.3.3 Temperature Protocols – Direct Cool and Frost – Free Appliances

Table 3-6 compares values of ambient temperature levels and compartment temperature settings required as part of the test conditions. The draft BEE and SLS standards require the same temperature test conditions as that of ISO 7371 and ISO 8187 except for the freezer compartment temperature setting. The difference in freezer compartment temperature is an important discrepancy that prevents direct comparison of results of test using the different protocols.

Table 3-6 Temperature Protocol – Direct Cool and Frost – Free Appliances

	ISO 7371/8187/8561	Draft BEE (India)	AS/ NZS	Draft SLS 1230:2003
Ambient Temperature (ºC)	25/32 ± 0.5	25/32 ± 0.5	25/32 ± 0.5	32 ± 0.5
Fresh Food Temperature (ºC)	≤ 5	5	3	5
Freezers (ºC)	* ≤ -6 ** ≤ -12 *** ≤ -18	STFC -6 FC -15	-15	-15 for Classes 4,5,6 &7 -9 for Class3

STFC: Short Term Freezer Compartment; FC: Freezer Compartment

3.3.4 Humidity, Test Period and Freezer Test Load – Direct Cool and Frost – Free Appliances

The draft BEE, draft SLS and ISO test procedures have more or less similar specifications with regard to humidity and test period, as shown in Table 3-7. It is unlikely that the small differences in these specifications would significantly impact the test results. There is one significant difference, however, namely the requirement of a freezer test load in the ISO test protocol. There is no such requirement in the other protocols. This difference should be eliminated, if results from the different test procedures are to be compared directly.

Table 3-7 Humidity, Test Period and Freezer Test Load

	ISO 7371/8187/8561	Draft BEE (India)	AS/ NZS	Draft SLS 1230:2003
Humidity (%)	45-75	70-80	Not Specified	45-75
Test Period (hrs)	≥24	wtcc ≥6 tcc ≥24	≥16	≥16
Test Load	**100%**	No Load	No Load	No Load

wtcc without temperature control cycle
tcc with temperature control cycle

3.3.5 Summary of Key Difference in ISO and Draft BEE / SLS Standards for Direct Cool and Frost Free Appliances

The ISO and Draft BEE / Draft SLS standards for direct cool refrigerator-freezers that are commonly used are more or less similar except the following minor differences:

- Draft BEE and SLS 1230:2003 uses different set of Temperatures for Refrigerator-Freezers in comparison to ISO star system for Freezer Compartment Ranking
- Draft BEE and SLS 1230:2003specify Test Without Load while ISO specifies **100%** Load

3.3.6 Summary of Key Difference in ISO and Draft BEE / SLS Standards for Frost Free Appliances Only

In addition to the differences listed above, there is another, more significant difference in the case of frost-free appliances. The ISO 8561 and Draft regional standards for frost-free refrigerator-freezers differ in the measurement of gross volume, which in turn may significantly impact efficiency rating.

- Draft BEE includes the inaccessible volume that is not usable. It causes a major difference in the capacity specify by the manufacturer of a refrigerator-freezer
- Draft SLS 1230:2003 excludes the inaccessible volume similar to ISO 8561

3.3.7 Refrigerator Test Procedure - Recommendations

We recommend, if feasible, the harmonization of refrigerator test procedures between Sri Lanka and India, and the development of a refrigerator labeling program utilizing harmonized procedures in Bangladesh and Nepal.

If practical, harmonized test procedures should be aligned with international norms. We recognize, however, that there may be significant reasons for policymakers to make modifications to these procedures. These reasons may have to do with particular characteristics of products in the national markets, or there may be logistical difficulties or additional expenses associated with carrying out the international standards as written. The SARI Energy program hopes to provide a useful forum where these details can be discussed openly, and solutions to these difficulties may be addressed. The previous sections provide technical details to facilitate these discussions.

3.4 Air Conditioner Test Procedures

Test procedures for room air conditioner efficiency in Asian countries also follow ISO procedures closely, but not exactly. The applicable standard is ISO 5151-1994, which covers air conditioners of any capacity and type provided they are non-ducted including cooling-only and reversible, single-phase and three-phase, and air-cooled or water-cooled units. Test procedures used in Asian countries are listed in Table 3-8.

Table 3-8 Room Air Conditioner Test Procedures

Country	Procedure	Type	Comments	Test Point
China	GB/T7725-1996	Single / Split	Similar to ISO 5151-94	ISO-T1
Hong Kong	ISO 5151-94	Single / Split		ISO-T1
Japan	JIS C 9612-94	Single / Split	Similar to ISO 5151-94	ISO-T1 (except water temp tolerances)
Korea	KS C 9306-97	Single / Split	Similar to ISO 5151-94	ISO-T1
Philippines	PNS 240-89	Single Only	Similar to ISO 5151-94	D (close to ISO-T1)
Singapore	SS C[24	Single / Split	Based on ISO 5151-94	
Chinese Taipei	CNS 3615	Single / Split	Similar to ISO 5151-94	very close to T1
Thailand	TIS 1155-2536	Split only	Thailand currently Aligning All Procedures to ISO	ISO-T1

Sources: Harrington et al - Review of Energy Efficiency Test Standards and Regulations in APEC Member Economies, APEC-ESIS Website

3.4.1 India Testing Program

As mentioned in Section 3.4, the Indian Bureau of Energy Efficiency has decided to adopt the Balanced Calorimeter test procedure described in ISO 5151 for its air conditioner labeling program.

3.4.2 Recommendation - Air Conditioner Test Procedures

We recommend that if there are differences in the current testing procedure proposed by BEE and the ISO procedure, these differences be detailed and a regional working group be informed of these differences. We further recommend that policymakers consider eliminating any such differences, if doing so would not be a significant disadvantage to the Indian program.

3.5 Ceiling Fan Test Procedures

Testing programs for ceiling fans are not extremely common, but there is some testing of fans in Asia, as shown in Table 3-9 below.

Table 3-9 Test Procedures for Fans

Country	Test Procedure	References / Comments
China	GB 12021.9-1989	
Philippines	PNS IEC 60335-2-80:2000	IEC 60335-2-80

Source: APEC - Energy Standards Information Systems Website

3.5.1 Sri Lanka Ceiling Fan Testing Program

Sri Lanka is in the process of developing a testing program for ceiling fan efficiency. Currently implementing agencies there are developing test facilities, and finalizing a proposed test procedures. While other countries in the SARI region are not known to be developing a labeling program for fans, laboratory facilities sufficient for fan testing are thought to exist in other countries in the region.

3.5.2 Ceiling Fan Test Procedures – Recommendation

There is an international test procedure for ceiling fans – ISO 60879. We recommend that policymakers consider adoption of this procedure. We further recommend that progress in the development of the program be communicated with representatives of the other countries in the region, with the aim of facilitating development of programs in these countries.

Section 4 Harmonization of Energy Ratings and Minimum Efficiency Performance Requirements

The major cost of an EES&L program to manufacturers lies in the testing of the products, in order to determine energy consumption over the test period. In order to rate the efficiency of the product, a calculation is performed. In the case of refrigerators, for example, higher volume refrigerators are allowed to consume more energy than smaller ones and still qualify for a high energy rating. The average level of energy ratings and the dependency of maximum consumption on capacity are generally country specific and there is no consensus on them. In general, these levels depend critically on the current appliance market in the country, as well as the goals of the program. It is in this area that it is perhaps most important to seek input from manufacturers and importers. In addition to manufacturer input, however, the determination of energy ratings is also the critical place to involve other stakeholders such as environmental and consumer advocates.

Harmonization of energy ratings with another country's program might save the country initiating a new program the commitment of resources necessary to determine the appropriate levels. It would only be advisable, however, once it is established that the markets of the two countries are very similar. One example would be the case of a small country with no manufacturing of a certain appliance, which imports nearly all of that appliance from a single larger country. It might then make sense to harmonize the energy ratings, since, presumably the government, manufacturers and advocates in the larger country have already spent the effort evaluating appropriate standards, and these same appliances constitute the market of the smaller country. This situation is extreme, however, since few markets are made up exclusively of imports from a single trading partner.

Harmonization of Minimum Efficiency Performance Standards (MEPS) can be challenging, but it does happen, especially among countries associated by strong free trade agreements. Examples of this are harmonization efforts by the European Community and NAFTA members. In a more extreme example, Australia and New Zealand have forged an agreement that *all* standards should be harmonized, if possible, due to the high degree of interconnectedness of the two economies[8].

Though harmonization of MEPS might be beneficial for trade reasons, it is important that each government carefully take into consideration the particularities of their situation.
For example, one possible strategy for determining where to set the limits for energy ratings is to have the outcome that a fixed percentage of the market is rated at a certain level. For example, the policy makers might wish that the top **10%** or **15%** of the refrigerators receive an endorsement label at the start of the program, for instance. This gives manufacturers an incentive to have as many of their models as possible in this elite

[8] Harmonization of Standards – The Australian and New Zealand Experience. David Cogan. CLASP Symposium – Lessons Learned in Asia: Regional Symposium on Energy Efficiency Standards and Labeling 2001.

category, which represents an attainable challenge. A statistical method of setting energy levels requires a significant amount of understanding of the market, which may not be available. Some of this data is necessary in all cases, however, in order to set levels which are neither too stringent, nor too lax.

4.1 Recommendations - Harmonization of Energy Ratings and Minimum Efficiency Performance Requirements

It is not recommended that policymakers harmonize energy ratings and minimum efficiency performance requirements *a priori*, rather that each program contain a research effort to determine performance levels based on sound market data. Nevertheless, there is still an opportunity to benefit from regional cooperation. As discussed in Section 3.3, the Indian Bureau of Energy Efficiency has embarked on a comprehensive program of data collection, in order to refine its determination of efficiency levels. We recommend that the design of this program, experiences during the process of data collection, and effective use of this data be shared with representatives of the other countries in the region via a working group established for this purpose.

Once a testing procedure is decided upon, the next component addressed is often the process of designing a label. As in the case of energy levels, it might be easier for the implementing government to adopt the same design as another country. In fact, several countries have very similar designs for some products. In general, however, countries developing programs design their own label in a way that is highly customized to their own consumers. Below are Label designs for refrigerators for India, Mexico, and Thailand.

Figure 5-1 Refrigerator Efficiency Labels – (left to right) India, Mexico, Thailand

The point of an appliance label is to provide energy information-to the consumer. The success of the awareness program depends critically on which design demands the attention of the consumer and presents efficiency in a favorable light. Also, the label design should be coordinated with the plan for media public awareness programs. It is highly recommended that each country perform focus group studies on consumers with a variety of label designs.

5.1 Recommendations - Label Design

As in the case of setting efficiency levels and minimum efficiency performance levels, the design of effective labels should not necessarily be harmonized, rather customized for the consumers of each country. Regional exchange of experiences regarding the methodology of label design is highly recommended, however. Both India and Sri Lanka have gone through the process of designing effective labels for their individual markets.

Part of the goals of a working group set up to discuss regional issues should be the effective exchange of expertise gained from this experience.

Section 6 Enforcement Issues

In every appliance efficiency program, a system of enforcement of regulations must be put into place that is practical and effective. Enforcement strategies are also varied from program to program. In some cases, manufacturers are expected to be self-policing, because of competition and fear of damage to company reputation. In others, enforcement is strictly implemented through product registration or customs inspection. Enforcement options vary dramatically in the cost to implement them, and guarantee of effectiveness, which must be balanced. There is no consensus on the best approach to take.

Generally, the burden of testing appliances rests on the provider – either the manufacturer or, in some cases the distributor. Manufacturers are then either given permission to affix labels (voluntary program) or required to do so (mandatory program). The regulating agency determines the design of the labels, but does not necessarily provide them. Within a mandatory program retailers can also be required to make sure all appliances are labeled. The basic component of any enforcement scheme is the verification of energy testing results. Since manufacturers are usually self-testing products, some verification is necessary that their results are accurate. In some cases, manufacturers are required to send several examples of each model to an independent testing lab at the manufacturer's expense. Finally, in a MEPS program, imports can be controlled directly by customs officials.

6.1 Enforcement Policy – Sri Lanka Ballast Program

By this time, implementing agencies in Sri Lanka have had several years of "real world" experience in enforcement issues related to a labeling program, namely that of fluorescent lamp ballasts. In particular, two main issues have come to light as part of the program.

- Inspection and Certification – Currently there are two independent certification requirements for imported labeled products. This has raised the issue of double certification for some importers.
- Counterfeit Labels – There has been a noticeable amount of inferior products that are labeled inappropriately. These products may sell for much less than genuine high-quality products, thus diminishing the effectiveness of the labeling program.

6.2 Enforcement Policy – Indian Refrigerator and Air Conditioner Program

The Indian Bureau of Energy Efficiency has developed a comprehensive enforcement plan for the labeling of refrigerators and air conditioners. The enforcement scheme is designed to allow the labeling program to be market-driven, rather than regulatory. The following provisions are made under the scheme:

- Manufacturers are responsible for labeling their own products. They will certify the efficiency of their products under the approved testing procedure, as tested in their own or in independent accredited laboratories. The manufacturers subsequently will assume liability for the accuracy of the label.
- A primary mechanism for the verification of efficiency labeling is challenge testing by consumers or by competing manufacturers. Challenge testing is to be performed by designated accredited independent laboratories.
- In addition to challenge testing, the government will conduct random check testing.

6.3 Recommendations - Enforcement

We recommend the establishment of a working group to exchange experiences regarding enforcement issues among all countries in the region. In particular, this group should facilitate the discussion of the enforcement experience in Sri Lanka, and what steps are currently being taken to address issues of enforcement in that country. In addition, issues which come up relating to the Indian enforcement scheme after that program is launched should be communicated to the working group.

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Appendix A Summary of Trade Data – Refrigerators and Air Conditioners

Source - United Nations Statistics Division - http://unstats.un.org/unsd/comtrade

Trade Flow - Export; Partner - Bangladesh - 2001 Data

Refrigerators, Household Compression Type [HS1992 code 841821]		Air conditioners window/wall types, self-contained [HS1996 code 841510]	
Reporter	**Trade Value ($US)**	**Reporter**	**Trade Value ($US)**
Thailand	$6,630,426	Singapore	$5,323,046
China	$4,433,358	Thailand	$541,695
Singapore	$304,720	China	$328,764
New Zealand	$209,361	Rep. of Korea	$278,123
Italy	$176,706	Netherlands	$217,639
Indonesia	$163,988	Malaysia	$123,626
Turkey	$52,498	Philippines	$56,753
Rep. of Korea	$43,600	Saudi Arabia	$42,055
Other Asia, nes	$18,516	France	$34,024
Denmark	$4,686	China, Hong Kong SAR	$21,802
United Kingdom	$3,599	Italy	$17,143
Other	$122,899		
TOTAL	$12,164,357	TOTAL	$6,984,670

Trade Flow - Export; Partner - India - 2001 Data

Refrigerators, Household Compression		Air conditioners window/wall types, self-	
Reporter	**Trade Value ($US)**	**Reporter**	**Trade Value ($US)**
Turkey	$888,417	Rep. of Korea	$4,448,787
Thailand	$335,634	Thailand	$2,519,495
Rep. of Korea	$328,617	Singapore	$1,030,766
USA	$184,664	Philippines	$870,438
Saudi Arabia	$161,915	Malaysia	$704,134
Brazil	$146,604	China	$447,895
Other	$96,357	Other	$214,507

Trade Flow - Export; Partner - Nepal - 2001 Data

Refrigerators, Household Compression		Air conditioners window/wall types, self-	
Reporter	**Trade Value ($US)**	**Reporter**	**Trade Value ($US)**
India	$149,568	Singapore	$156,845
Thailand	$104,086	India	$57,269
China	$64,490	Rep. of Korea	$28,654
Indonesia	$60,567	Malaysia	$18,166
Other	$60,689	Thailand	$10,784
TOTAL	$439,400	China	$3,998

Trade Flow - Export; Partner - Sri Lanka - 2001 Data

Refrigerators, Household Compression Type [HS1992 code 841821]		Air conditioners window/wall types, self-contained [HS1996 code 841510]	
Reporter	**Trade Value ($US)**	**Reporter**	**Trade Value ($US)**
Thailand	$2,104,856	Rep. of Korea	$1,112,710
Indonesia	$1,067,329	Singapore	$529,573
India	$673,180	China	$349,027
China	$355,748	Malaysia	$273,776
Singapore	$248,130	India	$255,320
Other	$362,735	Thailand	$209,208
		Other	$29,697